

WHAT IS CLAIMED IS:

1. A low temperature sinterable dielectric ceramic composition which comprises a major composition represented by the general formula:  $x\{a \text{ BaO}, (1-a) \text{ SrO}\} - y\{\text{SiO}_2\} - z\{(1-\beta) \text{ ZrO}_2, \beta \text{ Al}_2\text{O}_3\}$  (wherein  $x$ ,  $y$  and  $z$  are weight percentages;  $x+y+z=100$ ,  $55 \leq x \leq 75$ ,  $10 \leq y \leq 35$ , and  $5 \leq z \leq 30$ ,  $a$  and  $\beta$  are moles;  $0.4 \leq a \leq 0.8$ , and  $0.01 \leq \beta \leq 0.07$ ) and 2 to 10 parts by weight of a Zn-B-silicate glass composition, per 100 parts by weight of the major composition.

2. The composition as set forth in claim 1, wherein  $x$  is 60 to 65% by weight,  $y$  is 20 to 25% by weight, and  $z$  is 10 to 20% by weight.

3. The composition as set forth in claim 1, wherein the Zn-B-silicate glass composition comprises 15 to 25% by weight of  $\text{SiO}_2$ , 20 to 30% by weight of  $\text{B}_2\text{O}_3$ , and 40 to 50% by weight of  $\text{ZnO}$ .

4. The composition as set forth in claim 3, wherein the Zn-B-silicate glass composition further comprises 7% by weight or less of at least one selected from alkaline metals such as Li, K and Na and 5% by weight or less of  $\text{Al}_2\text{O}_3$ .



5. The composition as set forth claim 1, wherein the content of Zn-B-silicate glass composition is 4 to 8 parts by weight based on 100 parts by weight of the major composition.

5 6. A multilayer ceramic chip capacitor comprising a plurality of dielectric ceramic layers, internal electrodes arrayed inside the dielectric ceramic layers, and outer electrodes electrically connected to the internal electrodes, characterized in that the dielectric ceramic layer is a  
10 sintered body of the dielectric ceramic composition which comprises a major composition represented by the general formula:  $x\{a \text{ BaO}, (1-a) \text{ SrO}\} - y\{\text{SiO}_2\} - z\{(1-\beta) \text{ ZrO}_2, \beta \text{ Al}_2\text{O}_3\}$  (wherein  $x$ ,  $y$  and  $z$  are weight percentages;  $x+y+z=100$ ,  $55 \leq x \leq 75$ ,  $10 \leq y \leq 35$ , and  $5 \leq z \leq 30$ ,  $a$  and  $\beta$  are moles;  
15  $0.4 \leq a \leq 0.8$ , and  $0.01 \leq \beta \leq 0.07$ ) and 2 to 10 parts by weight of a Zn-B-silicate glass composition, per 100 parts by weight of the major composition, and the internal electrode is made of a conductive base metal material.

20 7. The capacitor as set forth in claim 6, wherein  $x$  is 60 to 65% by weight,  $y$  is 20 to 25% by weight, and  $z$  is 10 to 20% by weight.

25 8. The capacitor as set forth in claim 6, wherein the Zn-B-silicate glass composition comprises 15 to 25% by weight



of  $\text{SiO}_2$ , 20 to 30% by weight of  $\text{B}_2\text{O}_3$ , and 40 to 50% by weight of  $\text{ZnO}$ .

9. The capacitor as set forth in claim 6, wherein the  
5 Zn-B-silicate glass composition further comprises 7% by weight  
or less of at least one selected from alkaline metals such as  
Li, K and Na and 5% by weight or less of  $\text{Al}_2\text{O}_3$ .

10. The capacitor as set forth in claim 6, wherein the  
10 content of Zn-B-silicate glass composition is 4 to 8 parts by  
weight based on 100 parts by weight of the major composition.

11. The capacitor as set forth in claim 6, wherein the  
15 dielectric ceramic layer comprises a crystallized phase of  
some glass composition after sintered at 800 to 1,000°C.

12. A ceramic electronic device comprising a multilayer  
ceramic circuit board and at least one electronic elements  
which are mounted on the multilayer ceramic circuit board,  
20 characterized in that the multilayer ceramic circuit board  
comprises a plurality of dielectric ceramic layers, internal  
electrodes arrayed inside the dielectric ceramic layers, and  
outer electrodes electrically connected to the internal  
electrodes, the dielectric ceramic layer is a sintered body of  
25 the dielectric ceramic composition which comprises a major



composition represented by the general formula:  $x\{a \text{ BaO}, (1-a) \text{ SrO}\} - y\{\text{SiO}_2\} - z\{(1-\beta) \text{ ZrO}_2, \beta \text{ Al}_2\text{O}_3\}$  (wherein  $x$ ,  $y$  and  $z$  are weight percentages;  $x+y+z=100$ ,  $55 \leq x \leq 75$ ,  $10 \leq y \leq 35$ , and  $5 \leq z \leq 30$ ,  $a$  and  $\beta$  are moles;  $0.4 \leq a \leq 0.8$ , and  $0.01 \leq \beta \leq 0.07$ ) and 2 to 10 parts by weight of a Zn-B-silicate glass composition, per 100 parts by weight of the major composition, and the internal electrode is made of a conductive base metal material.

13. The electronic device as set forth in claim 12, wherein  $x$  is 60 to 65% by weight,  $y$  is 20 to 25% by weight, and  $z$  is 10 to 20% by weight.

14. The electronic device as set forth in claim 12, wherein the Zn-B-silicate glass composition comprises 15 to 25% by weight of  $\text{SiO}_2$ , 20 to 30% by weight of  $\text{B}_2\text{O}_3$ , and 40 to 50% by weight of  $\text{ZnO}$ .

15. The electronic device as set forth in claim 12, wherein the Zn-B-silicate glass composition further comprises 7% by weight or less of at least one selected from alkaline metals such as Li, K and Na and 5% by weight or less of  $\text{Al}_2\text{O}_3$ .

16. The electronic device as set forth in claim 12, wherein the content of Zn-B-silicate glass composition is 4 to 8 parts by weight based on 100 parts by weight of the major



composition.

17. The electronic device as set forth in claim 12,  
wherein the dielectric ceramic layer comprises a crystallized  
5 phase of some glass composition after sintered at 800 to  
1,000°C.